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Hashing, HashMaps, Collision & Resolution

Hash Code, Compression Function.

Hashing → It refers to a process of generating a fixed size output from an input of variable size using the mathematical formulas known as hash functions. This techniques determines an index or location for the storage of an item in a data structure.

Basically we use & modify array data structure because array provide O(1) time complexity to fetch data. we can also use BST's which provide log(n) in insertion, deletion or fetching.

(Number hashing) Probem:

But in Array we have limited memory in int main() we can allocate:

(10^6) size to an array and in global type array we can allocate (10^7) size.

So if our size of hash array exceeds the given limit the we have

Hashing Methods.

1) Division Methods.
2) Folding Methods } Not so imp.
3) Mid Square Methods.
4) Multiplication Methods.

In Division Methods. we use {%10} operation to store the data in the location.

This is where chaining comes in & collisions.

Example → we have

[0, 1, 2, 3, 4]

we have data.

1 2 ; 10
21 3 , 42
31

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Values & keys, frequency

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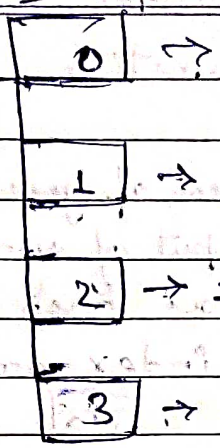
1, 21, 31
2, 3, 10
42

21 > size
21 % 10 = 1

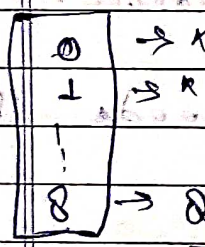


Linear

Here we are doing sequential chaining as we known. & the sequential chaining is in sorted order we can apply binary search or (upperbound − lowerbound) to find frequency. in (log n). T.C.

Now is collisions & what if the data entries are same

0, 10, 20, 30,



keys.

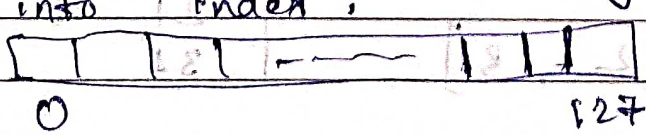
0, 10 % 10 = 0.

if size → 0 → 9.
else % according to given table values.

↳ This is called collisions.

We will cover collisions Resolution in later part / pages.

1) Creating character Hashing is might easy because it can be done using ASCII values and ASCII have 0 → 127 decimal values. which are easy to convert & store into index.



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for example → {character - 'a'} for finding index value or integer value.

like

ch = 'a' { 'a' - 'a' } = 0 → index → 0

if it contains capital alphabets 'A' create same formula.

Hash Code → To convert values to integers. for example we have to map string to values. or string keys to values, then.

then. Let a = 1, b = 2, c = 3 - - - etc.

for

Hash code →

ab	→	1+2 = 3,
cd	→	3+4 = 7
efg	→	5+6+7 = 18,

we have size of array is "7" → 0-6.

→ 18, 7 → size.

18 % 7 → 4.

because size is b/w 0-6 →

7 % 7 = 0.

key values →

0	1	2	3	4	5	6
cd			ab	efg		

second method. → [a | b] → (a x 0) + (b x 1) = 2

0 1

1 x 0 + 1/2 x 1

2 < size

↓

key

etc methods.

collision Resolution → seperate chaining / Open hashing

Open addressing / closed hashing

Closed hashing

- → Linear probing
- → Quadratic probing
- → Double hashing

} will cover in later Advance data structure.

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